

**IN THE CLAIMS:**

1-21. (Cancelled)

22. (New) Method for determining the redox state of an anode of a high-temperature fuel cell or a reaction surface of a reformer, which anode or reaction surface is in contact with a gas flow containing at least one of H<sub>2</sub>, CO and CH<sub>4</sub> and is coated with or made from a catalyst material, comprising the steps of

- bringing at least a first resonator of a piezoelectric sensor device into contact with said gas flow of said high-temperature fuel cell or said reformer, a surface of the first resonator being furnished with a coating which is oxidized or reduced in said gas flow,
- measuring at least one change in the resonance properties of the first resonator, and
- inferring the redox state of the anode of said high-temperature fuel cell or the reaction surface of said reformer from a change of the resonance properties of the first resonator.

23. (New) Method according to claim 22, wherein a change in the resonance frequency of the first resonator is measured.

24. (New) Method according to claim 22, wherein depending on the measured change of resonance properties, at least one operational parameter of the high-temperature fuel cell or the reformer is controlled or adjusted.

25. (New) Method according to claim 22, wherein at least one second resonator of the piezoelectric sensor device is brought into contact with the gas flow containing at least one of  $H_2$ , CO and  $CH_4$ , said second resonator having a coating which is chemically stable, and wherein a frequency difference between the first and second resonator of the sensor device is used as a measure for the redox state of said anode or said reaction surface.

26. (New) Method according to claim 25, wherein the resonance resistance of one of the first and second resonators, preferably the resonator with the chemically stable coating, is measured and the measured value is used as a measure for the pressure in the gas flow.

27. (New) Method according to claim 22, wherein the resonance frequency of one of the first and second resonators, preferably the resonator with the chemically stable coating, is measured and the measured value is used as a measure for the temperature in the gas flow.

28. (New) Device for determining the redox state of an anode of a high-temperature fuel cell or a reaction surface of a reformer, which anode or reaction surface is coated with or made from a catalyst material, wherein at least one first resonator of a piezoelectric sensor device is positioned in the gas flow of said high-temperature fuel cell or said reformer, said first resonator being provided with an oxidizable and reducible coating, and wherein there is provided a unit for measuring at least one change of the resonance properties of said first resonator, the measured value being a measure for the redox state of the anode of said high-temperature fuel

cell or of the reaction surface of said reformer.

29. (New) Device according to claim 28, wherein the oxidizable and reducible coating of the first resonator is made from material identical with the catalyst material of the anode of the high-temperature fuel cell or the catalyst material of the reaction surface of the reformer.

30. (New) Device according to claim 29, wherein the oxidizable and reducible coating of the first resonator is made from nickel-cermet, Ni/NiO, Cu/CuO, Pb/PbO, Co/CoO, Ag/AgO, or Pd/PdO.

31. (New) Device according to claim 28, wherein the piezoelectric sensor device comprises at least one second resonator which is placed in the gas flow of said fuel cell or said reformer, said second resonator having a coating which is chemically stable in said gas flow.

32. (New) Device according to claim 31, wherein the chemically stable coating of the second resonator is a noble metal or an oxide layer.

33. (New) Device according to claim 32, wherein the oxide layer comprises at least one oxide of a group consisting of SiO<sub>2</sub>, TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, CaO, MgO, and MnO.

34. (New) Device according to claim 28, wherein the piezoelectric sensor device is positioned on the outlet side of the anode gas flow of the high-temperature fuel cell.

35. (New) Device according to claim 28, wherein the piezoelectric sensor device is placed in the anode gas space of the high-temperature fuel cell.

36. (New) Device according to claim 28, wherein the piezoelectric sensor device is placed on the inlet or outlet side of the gas flow into or from the

reformer.

37. (New) Piezoelectric sensor device for determining the redox state of an oxidizable and reducible coating, wherein the oxidizable and reducible coating is applied to the surface of at least one first resonator of the sensor device, the resonator surface being flow-connected to the anode gas space of a high-temperature fuel cell or the gas space of a reformer.

38. (New) Piezoelectric sensor device according to claim 37, wherein a chemically stable coating is applied to the surface of at least one second resonator of the sensor device, which coating does not show any redox behaviour in the gas flow of the high-temperature fuel cell or the reformer.

39. (New) Piezoelectric sensor device according to claim 38, wherein the chemically stable coating is made from a noble metal or  $\text{SiO}_2$ ,  $\text{TiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ , or  $\text{MnO}$ , whilst the oxidizable and reducible coating is made from nickel-cermet,  $\text{Ni/NiO}$ ,  $\text{Cu/CuO}$ ,  $\text{Pb/PbO}$ ,  $\text{Co/CoO}$ ,  $\text{Ag/AgO}$ , or  $\text{Pd/PdO}$ .

40. (New) Piezoelectric sensor device according to claim 38, wherein the first and second resonators are configured as BAW- or SAW-resonators.

41. (New) Piezoelectric sensor device according to claim 37, wherein the first resonator is configured as a BAW-resonator with an oxidizable and reducible coatings on both opposite surfaces.

42. (New) Piezoelectric sensor device according to claim 37, wherein the chemically stable coating and the oxidizable and reducible coating are applied on two areas of one piezoelectric crystal element.